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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/090,630	03/06/2002	David S.Y. Hsu	83,661	5396

26384 7590 01/14/2003

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EXAMINER

CLEVELAND, MICHAEL B

ART UNIT PAPER NUMBER

1762

DATE MAILED: 01/14/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/090,630

Applicant(s)

HSU ET AL.

Examiner

Michael Cleveland

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Specification

1. The objections to the specification are withdrawn in view of Applicant's amendment.

Claim Rejections - 35 USC § 112

2. The rejections under 35 USC 112 are withdrawn in view of Applicant's amendment.

Claim Rejections - 35 USC § 102

3. The rejections under 35 USC 102 are withdrawn in view of Applicant's amendment to explicitly require repetition of the spreading and drying steps. However, the claims are rejected under 35 USC 103.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claim 18, 25-26, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Haluska et al. (U.S. Patent 5,635,249, hereafter '249) in view of Fratello et al. (U.S. Patent 4,965,091, hereafter '091).

'249 teaches

- a) providing a solution comprising an alkoxide precursor (the product of (c) below) (col. 2, lines 26-42) and a dopant precursor (col. 3, lines 7-15);

- b) mixing said solution with a solid particle precursor (col. 3, line 66-col. 4, line 7);

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c) inducing a sol-gel condensation reaction to form a sol-gel condensation reaction mixture (col. 2, lines 35-38);

d) spreading the sol-gel mixture on a substrate (col. 4, lines 64-67);

e) drying the sol-gel reaction mixture (col. 5, lines 4-12);

f) producing a desired thickness of film (col. 4, lines 8-22); and

g) heating the thick film (col. 5, lines 18-26).

'249 does not teach the repetition of the spreading and drying steps. However, the Examiner takes Official Notice that it is extremely well known in the sol-gel art that a desired thickness may be achieved by repeated application and drying of the sol-gel mixture. See, e.g., '091, col. 3, lines 53-56). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have repeated the applying and drying steps of '249 in order to have achieved the desired coating thickness.

Claim 25: The dopant precursor may be tetraisobutoxy titanium, an alkoxide (col. 3, lines 16-30).

Claim 26: The solid particles may be zinc sulfide (col. 3, line 66-col. 4, line 7).

Claim 28: The particle size may be 10 microns (10,000 nm) (col. 4, lines 14-22).

The process produces a phosphor layer on a substrate (i.e., a multilayer phosphor product on a substrate).

7. Claims 18-21, 23-26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haluska '249 and Levene (U.S. Patent 3,927,224, hereafter '224) in view of each other and further in view of Fratello '091.

'249 is described above. It teaches the formation of a sol-gel reaction mixture, the spreading of the mixture on the substrate, and the dry and firing of the mixture to form a phosphor-coated substrate. It does not explicitly teach the inclusion of a hydrolysis agent during the formation of the sol-gel reaction mixture.

'224 teaches

a) providing a solution comprising an alkoxide precursor (col. 2, lines 42-52) and a dopant precursor (col. 2, lines 53-56);

b) mixing said solution with a solid particle precursor (col. 2, lines 62-66; col. 3, line 64-col. 4, line 18);

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c) inducing a sol-gel condensation reaction to form a sol-gel condensation reaction mixture (col. 2, lines 56-62; col. 6, lines 51-61).

It also teaches e) drying the condensation reaction mixture (col. 6, line 63-col. 7, line 68) and g) heating to form a glass with a phosphor dispersed therein on a substrate (col. 7, lines 11-31). However, it appears that the sol-gel reaction mixture is first fired to form granules of phosphor dispersed in glass, and then mixed with another solvent, and applied to the substrate (col. 7, lines 11-31). Therefore, '224 does not teach that the sol-gel condensation reaction mixture is spread on a substrate.

Taking the references as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied the sol-gel condensation reaction mixture of '224 directly to the substrate before drying and firing with a reasonable expectation of success because '249 demonstrates that sol-gel condensation reaction mixtures may be directly applied to substrates before drying and firing and because one of ordinary skill in the art would have recognized that the process of '249 uses fewer steps (applying, drying, and firing) than that of '224 (drying, firing, redispersing in solvent, applying, drying, and firing) and would therefore have been more efficient. Also, '249 does not give any particular guidance on the order of mixing to produce sol-gel condensation reaction mixtures containing phosphor particles. '224 gives specific method operative to produce such mixtures. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the method of '224 to have produced the sol-gel condensation reaction mixture of '249 with a reasonable expectation of success and with the expectation of similar results because '224 demonstrates that its method is operative to produce a sol-gel condensation mixture.

'249 and '224 do not teach the repetition of the spreading and drying steps. However, the Examiner takes Official Notice that it is extremely well known in the sol-gel art that a desired thickness may be achieved by repeated application and drying of the sol-gel mixture. See, e.g., '091, col. 3, lines 53-56). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have repeated the applying and drying steps of '249 and '224 in order to have achieved the desired coating thickness.

Claims 19 and 23: '224 teaches that the solution may contain water, a hydrolysis agent (col. 2, lines 45-52; col. 5, lines 28-60).

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Claims 20-21 and 24: '224 teaches that the particles may be added in any of its steps (1)-(3) prior to gelling in step (3) (col. 2, lines 56-65). '224 also teaches that the addition of water, a hydrolysis agent, causes the gelling in step (3) (col. 2, lines 56-62 and col. 6, lines 52-61). Thus, it is clear that the water is added after the particles because the particles are to be added before gelling, and that the hydrolysis agent, water, is added immediately before the gelling condensation reaction because it causes the condensation reaction.

Claims 25-26 and 28: See also discussion of '249 above.

8. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haluska '249, Levene '224, and Fratello '091 in view of each other, as applied to claim 18 and further in view of Kilian et al. (U.S. Patent 5,622,750, hereafter '750).

'249 and '224 are discussed above. They do not explicitly state that a reagent capable of inhibiting condensation reactions is included in the solution before adding the particles. However, '224 does teach that it is desired to add particles before the sol is gelled (col. 3, lines 62-65).

'750 teaches the inclusion of an acid as a catalyst that promotes hydrolysis but keeps gelling from occurring too quickly in silicon oxide precursor solutions (col. 3, lines 54-56). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added such an condensation inhibiting agent to the solution of '224 before the particles are added in order to have promoted the hydrolysis of step (1) while slowing down gellation of the sol until the particles could have been added.

9. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Haluska '249, Levene '224, and Fratello '091 in view of each other, as applied to claim 18 and further in view of Francis et al. (U.S. Patent 4,517,037, hereafter '037).

'249 and '224 are discussed above. '249 teaches that the sol-gel condensation reaction may include other fillers besides the phosphor filler, such as silica (col. 3, lines 49-65). However, the references do not teach the inclusion of fumed silica.

'037 teaches the use of fumed silica as a filler in compositions containing silica sol binders, which are similar to and compatible with the precursor sol of '249 (see, e.g., '249, col.

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1, lines 19-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used fumed silica as the particular type of silica filler of '249 with a reasonable expectation of success because '037 teaches that fumed silica is a useful filler for silica sols.

Response to Arguments

10. Applicant's arguments filed 11/18/2002 have been fully considered but they are not persuasive.

Applicant argues that the starting material is a resin rather than an alkoxide. The argument is unconvincing because the resin may be an alkoxide (col. 2, lines 35-37).

Applicant argues that the phosphor of the present application is the product of a sol-gel reaction whereas the phosphor layer of the prior art merely encases a phosphor in a sol-gel reaction product. The argument is not commensurate in scope with the claims. There is no indication in the claims that the phosphor is formed by reaction. The claims are inclusive of the process of Haluska '249. However, it does not appear that amendment of the claims to positively recite that the phosphor material is a sol-gel reaction product of the precursors of step (a) would render the claims allowable because the formation of phosphor layers from sol-gel mixtures is known. See, e.g., previously cited de Leeuw (U.S. Patent 4,931,312, especially cols. 3-6) and newly cited Petersen (U.S. Patent 5,747,100, especially col. 6).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fratello et al. (U.S. Patent 4,965,091), Chadha et al. (U.S. Patent 5,695,809), Torikoshi et al. (U.S. Patent 5,643, 685), and de Leeuw et al. (U.S. Patent 4,931,312) all teach sol-gel methods of depositing luminescent coatings. Note that each teaches the repetition of coating and drying to form a desired thickness ('091: col. 3, lines 53-56; '809: Fig. 2; '685, col. 5, lines 66-67; '312, col. 4, lines 43-48). Peterson (U.S. Patent 5,747,100) is cited for its teachings of the formation of phosphor layers via sol-gel reaction (col. 6).

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703) 308-2331. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 306-3186 for regular communications and (703) 306-3186 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MBC

MBC

January 8, 2003



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